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CO_2 Technology Centre Mongstad: Environmental surveillance of the Mongstad area

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Abstract

CO_2 Technology Centre Mongstad is the world's largest facility for testing and improving CO_2 capture technologies. Removing CO_2 from flue gases by using post-combustion amine technology, reduces the emission of greenhouse gases to the atmosphere, but inevitably causes some emissions of amines and amine related degradation products to the atmosphere. In order to monitor the ambient air concentrations and water deposition of these compounds prior to the startup of TCM, a baseline survey was conducted in 2011/2012 by Norwegian Institute for Air Research (NILU, Tønnesen et al., 2011) and Norwegian Institute for Water research (NIVA, Grung et al., 2012). Subsequent to the air and water baseline study in 2011/2012, there has been an extensive method development with regards to the analysis of amines. The improved methods cannot reproduce the results with respect to aquatic occurrence of amines that were obtained during the baseline studies. In the baseline study, sensitive species and receptors were selected to monitor the possible environmental effects of the emissions, both with regards to toxicity, eutrophication and acidification. Reported air dispersion calculations (Berglen et al., 2010; Tønnesen, D. et al., 2011) were used to define the area that was covered. The NIVA baseline study covered aquatic and terrestrial locations in the area potentially affected by the emissions. A refined monitoring plan was agreed upon in April 2013, and was designed to cover the possible harmful effects, but not effects of eutrophication or acidification from TCM. The major adaption with respect to the proposed monitoring in the baseline study was a reduction in the monitoring of both terrestrial and aquatic organisms with respect to possible eutrophication (nutrient enrichment by nitrogen deposition). The justification for this was the modest nitrogen emission from TCM relative to the ongoing N emissions from the neighboring refinery and power plant at Mongstad.

At the present time, several analytical laboratories are capable of analyzing amines, nitramines and nitrosamine, even though it remains challenging to adequately acquire the measurement level of detection (LOD) that is required

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for being able to measure the occurrence of the nitramines/nitrosamines in aquatic environment below the recommended guideline of 4 ng/L (Låg et al., 2011). The purpose of the water surveillance study was therefore twofold: A total of 5 different lakes were investigated. Tree different lakes in the vicinity of TCM, in order to perform a monitoring of aquatic environment in the Mongstad area and compare the levels with two independent reference lakes. The reference lakes are located at the west coast and eastern inland of Norway. The latter lake was also utilised in the previous monitoring of TCM, but not in the baseline monitoring. The sampling of the lakes was performed during autumn circulation of the lakes in mid-October 2016. The purpose was hence to: (1) gain experience with different laboratories for analysis of the three compound groups amines/nitramines/nitrosamines (A/NA/NsA) in lake water. The water samples were therefore distributed to 5 laboratories for analyses, however, only two of the labs performed analyses on all three compound groups, and (2) gain analysis results from the samples collected.

The work will also aim to summarize the ambient Air Measurement done in the Mongstad area, and compare these results with the levels found in the lakes.